LDRD@SNL

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Sandia National Laboratories
Laboratory Directed Research and Development

We welcome your questions, comments, and ideas for future LDRD projects to feature! Email your feedback to Marie Arrowsmith, mdarrow@sandia.gov

Real-Time, Autonomous Field Surveillance for Vector-Borne Pathogens

Robert Meagher (PI), Cameron Ball, Jason Harper, Aashish Priye, Ronald Renzi.

Sandia's QUASR enables speedy, accurate detection of West Nile and other viruses using a new technique that causes viral DNA to glow when detected.

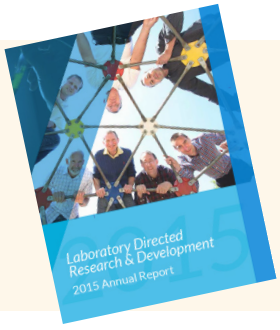
LDRD researchers at Sandia have developed a simple technique for simultaneously detecting RNA from West Nile and chikungunya virus in samples from mosquitoes. The technique, described in Analytical Chemistry, "Quenching of unincorporated amplification signal reporters (QUASR) in RT-LAMP enables bright, single-step, closed-tube and multiplexed detection of RNA viruses," is now being applied to screen for Zika virus. The team explored reverse-transcription loop mediated isothermal amplification (RT-LAMP), an isothermal nucleic acid amplification technique used instead of the more common polymerase chain reaction (PCR) for low-cost or point-of-care diagnostics for infectious diseases. RT-LAMP relies on primers, DNA fragment sequences, that bind to a target — the RNA of the virus of interest — and then generate a large amount of DNA. By fluorescently labeling the primer, the new DNA glows as it is produced. If the primer doesn't find the viral RNA, there is no glow.

QUASR is simple enough to be used in a field laboratory. The Sandia team is working to incorporate QUASR into a handheld device, whereby a user can get a definitive yes or no result in about half an hour. More details like the amount of viral RNA present in the sample would still require laboratory PCR. Robert Meagher, the project's PI, recently received an NIH grant, in partnership with UT Medical Branch, to develop a field-deployable assay for differential diagnosis of malaria and viral febrile illnesses, including Ebola.

Read more here.

2015 Annual Report Released!

The report includes progress reports from 380 individual R&D projects in 14 categories, as well as an overview of Sandia's LDRD Program.



Non-Linear Transmission Line Based Technology

Juan Elizondo-Decanini (PI), Phillip Coleman, Evan Dudley, Gregory Lyons, Tim Penner, Kevin Youngman.

A Sandia LDRD project focuses on nonlinear behavior in materials by using harmonic waves called solitons and studying, for example, how nonlinearity might be used in capacitors to further improve cell phone reception or lock out computer hackers.

High-quality capacitors are considered linear because capacitance (stored charge) value doesn't change as voltage is applied. In a nonlinear capacitor, capacitance value changes as voltage is applied, so the energy or stored charge is different from what was expected. Sandia received U.S. patent 8,922,973 this year for "a detonator comprising a nonlinear transmission line" developed by Elizondo-Decanini. The patent describes using a nonlinear feature to obtain very high voltages.

Nonlinear behavior would seem undesirable in detonators, where safety is paramount. The main safety feature in a detonator is a driver circuit and switch that prevent accidental activation. Detonator drivers use high-quality linear capacitors to ensure exact current so the detonator works only when the switch is flipped. However, high-quality capacitors are expensive due to the huge research investments needed to explore linear materials and the sophisticated designs those materials require.

The team focused on electrical solitons for a high-resistance detonator made with cheap capacitors. Solitons, used in laser and fiber optic communication, are harmonic waves that travel long distances without losing shape. They can be generated with nonlinear materials arranged as a transmission line; hence the patent's name. Elizondo-Decanini explains the advantage of this new detonater, "Instead of putting in 300 volts to get out 300 volts, perhaps you put in 100 and get out 1,000." The result is being tested with other Sandia research groups studying ultra-wide bandage materials, pressure sensors for micro-discharge plasma, and encryption methods.

Read more here.

LDRD PROJECTED BUDGET AND STATUS

FY16 Q3 $155 MILLION 356 PROJECTS FUNDED

Upcoming Events

May 16-19 - REHEDS External Review Board meeting
May 18 - Deadline for full proposal submission
May 23 - June 23 - Proposal review period
July 14 - PIs and PMs notified of proposal funding status

Sandia National Laboratories

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